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What is This?
Effect of Presence/Absence of a Nasogastric Tube in the Same Person on Incidence of Aspiration

Michael Fattal, MD1, Debra M. Suiter, PhD, CCC-SLP2, Heather L. Warner, MA, CCC-SLP3, and Steven B. Leder, PhD, CCC-SLP1

Objective. To determine what effect, if any, the presence or absence of a nasogastric (NG) tube in the same person had on the incidence of anterograde aspiration.

Design. Case series with planned data collection.

Setting. Large, urban, tertiary care teaching hospital.

Subjects and Methods. Referred sample of 62 consecutively enrolled adult inpatients for fiber-optic endoscopic evaluation of swallowing (FEES). Group 1 (n = 21) had either small-bore (n = 13) or large-bore (n = 8) NG tubes already in place and had a FEES first with the NG tube in place and a second FEES after NG tube removal. Group 2 (n = 41) did not have an NG tube and had a FEES first without an NG tube and a second FEES after placement of a small-bore NG tube. Time between FEES was approximately 5 minutes. Patients were tested with thin liquid and puree food consistencies. Occurrence of aspiration for each consistency dependent on the presence or absence of an NG tube was recorded.

Results. There were no significant differences (P > .05) in aspiration status for both liquid and puree consistencies in the same person dependent on presence or absence of either a small-bore or large-bore NG tube.

Conclusions. Since objective swallowing evaluation (eg, FEES) can be performed with an NG tube in place, it is not necessary to remove an NG tube to evaluate for aspiration. Similarly, there is no contraindication to leaving an NG tube in place to supplement oral alimentation until nutritional requirements are achieved.

Keywords
deglutition, deglutition disorders, nasogastric tube, aspiration

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The use of a nasogastric (NG) tube to provide nutrition, hydration, and medication to patients who are either nil per os due to dysphagia or unable to take adequate oral alimentation is both long-standing and common in clinical practice.1-3 Although placement of an NG tube is relatively atraumatic and usually well tolerated,4 there are widespread clinical misperceptions regarding the purported impact an NG tube may have on safe and successful swallowing.5

Since an NG tube is a foreign object that traverses the same path as a food bolus through the entire pharynx and esophagus and into the stomach, concerns have been raised regarding the consequences of its use.5,6 The potential exists for a negative impact on safe and efficient pharyngeal swallowing ability, resulting in increased anterograde aspiration (defined as aspiration during oral alimentation due to pharyngeal dysphagia; hereafter aspiration). NG tube placement in 10 healthy adults resulted in slowed pharyngeal bolus transit, but neither small-bore nor large-bore tubes altered overall swallowing function.7 In a before-after NG tube trial with 22 stroke patients, no statistically significant differences were found for pharyngeal transit times or swallow functions and no aspiration occurred.8 Also, the presence of a 3.6-mm-diameter flexible fiber-optic endoscope in the nasopharynx of 14 normal adult volunteers did not significantly alter specific temporal measures of swallowing (ie, durations of stage transition, pharyngeal transit, or maximum hyoid elevation) and had no effect on aspiration status.9 Lastly, a large matched-group study (ie, 630

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subjects with either a small-bore or large-bore NG tube were compared with 630 different subjects without an NG tube) reported no relationship between NG tube use and aspiration of either thin liquid or pureed food consistencies. Therefore, allowing for minor temporal differences, and with NG tubes of differing diameters present in the pharynx and esophagus, a safe swallow without aspiration occurred at all times.

It has not been possible, however, to generalize what effect, if any, an NG tube has in the same person due to small sample sizes with homogeneous populations and use of a matched-group design. Also, although fiber-optic endoscopy has demonstrated equal to or greater sensitivity than fluoroscopy in the detection of laryngeal penetration and tracheal aspiration, endoscopy has not been used to investigate aspiration status in the same person as a function of NG tube presence. The purpose of the present study was to investigate with endoscopy the incidence of tracheal aspiration based on the presence or absence of an NG tube in the same person drawn from a larger and more heterogeneous referred population sample.

**Methods**

**Participants**

The study was approved by the Human Investigation Committee of Yale University School of Medicine. A total of 62 consecutive inpatients referred for dysphagia evaluations from a large, urban, tertiary care teaching hospital in a prospective manner participated and served as their own control. Inclusion criteria required patients older than 18 years and with adequate cognitive ability to participate in a transnasal fiber-optic swallowing evaluation.

**Procedures**

The standard fiber-optic endoscopic evaluation of swallowing (FEES) protocol with slight modifications was used. Briefly, each naris was examined visually and the scope passed through the most patent naris without administration of a topical anesthetic or vasoconstrictor to the nasal mucosa, thereby eliminating any potential adverse anesthetic reaction and ensuring the endoscopist of a safe physiologic examination. The base of the tongue, pharynx, and larynx was viewed and swallowing evaluated directly with 6 food boluses of approximately 5-mL volume each. The first food challenge consisted of 3 boluses of puree consistency (liquid and puree; white skim milk), because these colors have excellent consistency (yellow pudding) followed by 3 thin liquid boluses.

**Results**

A heterogeneous population sample (N = 62) included a wide variety of admitting diagnostic categories and varied NG tube diameter use (Table 1). A Student t test for independent samples found no significant age differences between group 1 and group 2 (t = 0.98; P > .05; Table 2). The exact McNemar test (Stata, College Station, TX) indicated no significant differences (P > .05) between group 1 and group 2 for overall incidence of aspiration dependent on either presence of absence of an NG tube and bolus consistency (liquid and puree; Table 3) or NG tube diameter.
All participants without an NG tube who did not aspirate continued not to aspirate when an NG tube was present. Conversely, no participant who aspirated with an NG tube in place swallowed successfully after tube removal. (Table 4 shows that 1 participant aspirated a small amount of pharyngeal residue while talking after FEES was completed.)

Discussion
This study was designed to determine the effect that an NG tube had on incidence of aspiration in a large and heterogeneous population sample of participants who served as their own control (Table 1). The finding that presence or absence of an NG tube in the same person had no effect on aspiration status was confirmed with a different testing method (ie, endoscopy rather than fluoroscopy) and supports prior research derived from both small and homogeneous reports7-9 as well as from a large matched-group study.6 Importantly, consensus permits generalization of these results to a larger and more heterogeneous patient population, even taking into account that large-bore NG tubes were not randomly assigned. Specifically, since neither a small-bore nor a large-bore NG tube increased the incidence of aspiration, it can be stated confidently that when there is no aspiration before placement of an NG tube, there will be no aspiration after placement, and, conversely, aspiration will continue to occur regardless of the presence or absence of an NG tube. To wit, there was no causal relationship between NG tube presence and aspiration status.

Interestingly, the present study also corroborated a recent report that dealt with the effect of orogastric (OG) tubes on aspiration status and recommendations for oral feeding.20 Despite the fact that both NG and OG tubes traverse the same pathway as a food bolus, the presence or absence of either tube did not affect incidence of aspiration or aspiration by food consistency (liquid or puree). Therefore, it is not necessary to remove either an NG or OG tube to evaluate aspiration, and there is no contraindication to leaving either tube in place to supplement oral alimentation until prandial nutrition is adequate. Lastly, it has been reported that the diameter of an NG tube (ie, small bore or large bore) and bolus consistency (liquid and puree; Table 4).

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bore) did not reduce gastroesophageal reflux or retrograde microaspiration of gastric contents. Although tube diameter did not increase the incidence of anterograde aspiration in either the present investigation or corroborating studies, this does not preclude retrograde aspiration from occurring during enteral feeding. Therefore, to minimize risk during NG tube feeding, it is recommended that the head of the bed remain elevated at 30°, gastric residuals monitored every 4 hours, rate of feeding individualized, and the tube and/or oral feedings stopped 20 to 30 minutes prior to repositioning the patient in bed.

**Study Strengths and Limitations**

Major strengths of this study that allowed generalizability of results included participants accrued in a prospective and consecutive manner, an adequate sample size with appropriate statistical power to confidently answer the research question, FEES used as the criterion standard for detection of tracheal aspiration, and a wide variety of diagnoses representative of the inpatient population of a large, urban, tertiary care teaching hospital. Limitations of this study were use of a referral-based population sample versus a randomized controlled research design and a smaller number of subjects with large-bore NG tubes. Future research should explore NG tube placement and aspiration status in very young (0-10 years) and very old (90-100+ years) individuals and the impact, if any, of duration of NG tube use on swallowing success.

**Conclusions**

The presence of an NG tube, regardless of age, diagnostic category, or tube diameter, did not affect incidence of aspiration for either liquid or puree food consistencies. Since an objective swallowing evaluation (ie, endoscopic or videofluoroscopic) can be performed with an NG tube in place, it is not necessary to remove an NG tube to evaluate aspiration status. Similarly, there is no contraindication to leaving an NG tube in place to supplement oral alimentation until prandial nutrition is adequate.

**Author Contributions**

Michael Fattal, conception and design, acquisition of data, analysis and interpretation of data, drafting and revising, final approval; Debra M. Suiter, analysis and interpretation of data, drafting and revising, final approval; Heather L. Warner, drafting article, revising, final approval; Steven B. Leder, corresponding author, conception and design, acquisition of data, analysis and interpretation of data, drafting and revising, final approval.

**Disclosures**

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